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## WHAT IS CLAIMED IS:

1. A method, comprising:

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exposing a surface to a first gas composition under conditions sufficient to deposit a layer of a first chalcogenide glass on the surface; and

exposing the layer of the first chalcogenide glass to a second gas composition under conditions sufficient to deposit a layer of a second glass on the layer of the first chalcogenide glass, wherein the second glass is different from the first chalcogenide glass.

- 10 2. The method of claim 1, wherein exposing the surface to the first gas composition comprises activating a plasma in the first gas composition
  - 3. The method of claim 2, wherein activating a plasma in the first gas composition comprises exposing the gas to electromagnetic radiation to activate the plasma.
  - 4. The method of claim 3, wherein the electromagnetic radiation comprises microwave radiation.
  - 5. The method of claim 3, wherein the electromagnetic radiation comprises radio frequency radiation.
    - 6. The method of claim 1, wherein exposing the layer of the first glass to the second gas composition comprises activating a plasma in the second gas composition.
- 7. The method of claim 6, wherein activating a plasma in the second gas composition comprises exposing the gas to electromagnetic radiation to activate the plasma.
  - 8. The method of claim 7, wherein the electromagnetic radiation comprises microwave radiation.

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9. The method of claim 7, wherein the electromagnetic radiation comprises radio frequency radiation.

- 10. The method of claim 1, wherein the second gas composition is different from the first gas composition.
  - 11. The method of claim 1, wherein the first gas composition comprises one or more halide compounds.
- 12. The method of claim 11, wherein the one or more halide compounds comprises a chloride compound.
  - 13. The method of claim 1, wherein the first gas composition comprises a carrier gas.
- 15 14. The method of claim 13, wherein the carrier gas comprises nitrogen.

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- 15. The method of claim 13, wherein the carrier gas comprises a noble gas.
- 16. The method of claim 15, wherein the noble gas is argon.
- 17. The method of claim 1, wherein the first gas composition comprises a chalcogen.
- 18. The method of claim 1, wherein the first gas composition pressure is between about 2 and 20 Torr.
- 19. The method of claim 1, wherein the second gas composition comprises one or more halide compounds.
- The method of claim 19, wherein the one or more halide compounds comprises a chloride compound.

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21. The method of claim 1, wherein the second gas composition comprises a carrier gas.

- 22. The method of claim 21, wherein the carrier gas comprises nitrogen.
- 5 23. The method of claim 21, wherein the carrier gas comprises a noble gas.
  - 24. The method of claim 23, wherein the noble gas is argon.

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- 25. The method of claim 1, wherein the second gas composition comprises a chalcogen.
  - 26. The method of claim 1, wherein the second gas composition comprises oxygen.
  - 27. The method of claim 1, wherein the second gas composition pressure is between about 2 and 20 Torr.
  - 28. The method of claim 1, wherein the second glass is an oxide glass.
  - 29. The method of claim 1, wherein the second glass is a chalcogenide glass.
- 20 30. The method of claim 1, wherein the surface is a surface of a tube.
  - 31. The method of claim 30, wherein the surface is an inner surface of a tube.
  - 32. The method of claim 30, wherein the tube comprises a glass.
  - 33. The method of claim 32, wherein the glass is a silicate glass.
  - 34. The method of claim 32, wherein the tube comprises a polymer.
- 35. The method of claim 1, wherein the surface is a planar surface.

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36. A method, comprising:

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introducing a first gas composition into a tube, the first gas composition comprising a first compound that is substantially inert with respect to a first material forming the inner surface of the tube; and

exposing the first gas composition to conditions sufficient to change the first compound into a second compound reactive with the first material and to deposit a layer of a second material on the inner surface of the tube.

- 37. The method of claim 36, wherein exposing the first gas composition to conditions sufficient to change the first compound into a second compound comprises activating a plasma in the first gas composition.
- 38. The method of claim 37, wherein activating the plasma comprises exposing the first gas composition to electromagnetic radiation.
- 39. The method of claim 38, wherein the electromagnetic radiation comprises microwave radiation.
- 40. The method of claim 38, wherein the electromagnetic radiation comprises radio frequency radiation.
  - 41. The method of claim 36, wherein the first compound comprises oxygen.
  - 42. The method of claim 41, wherein the first compound is nitrous oxide.
  - 43. The method of claim 42, wherein the second compound is oxygen.
  - 44. The method of claim 38, wherein the first material is a glass.
- The method of claim 44, wherein the glass is a chalcogenide glass.

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46. The method of claim 36, further comprising exposing the layer of the first material to a second gas composition under conditions sufficient to deposit a layer of a second material on the layer of the first material, wherein the second glass is different from the first glass.